CLAIMS

1. A filter structure having a certain impedance level and having a first piezoelectric resonator, whose resonance frequency is a first resonance frequency and which is connected to an input conductor of said filter structure, said filter structure comprising, in order to increase the power handling capacity of the filter structure, a chain of piezoelectric resonators, said chain comprising at least two piezoelectric resonators, connected in series with the first piezoelectric resonator and forming together with the first piezoelectric resonator a plurality of piezoelectric resonators connected in series, and wherein

- each piezoelectric resonator belonging to said chain of piezoelectric resonators has a resonance frequency substantially equal to the first resonance frequency,
- said plurality of piezoelectric resonators is connected to the rest of the filter structure only through the first piezoelectric resonator at one end of said plurality of piezoelectric resonators connected in series and through a second piezoelectric resonator, which is at the other end of said plurality of piezoelectric resonators connected in series, and
- impedance of said plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

2. A filter structure according to claim 1, further comprising a second plurality of piezoelectric resonators connected in series, said plurality comprising at least two piezoelectric resonators, and wherein

- each piezoelectric resonator belonging to said second plurality of piezoelectric resonators has a resonance frequency equal to a second resonance frequency,
- said second plurality of piezoelectric resonators is connected to the rest of the filter structure only through a third piezoelectric resonator at one end of said second plurality of piezoelectric resonators connected in series and through a fourth piezoelectric resonator, which is at the other end of said second plurality of piezoelectric resonators connected in series, and
- the impedance of said second plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

3. A filter structure according to claim 2, wherein the first resonance frequency is substantially equal to the second resonance frequency.

4. A filter structure according to claim 2, wherein the first resonance frequency is different from the second resonance frequency.

5. A filter structure according to claim 2, wherein said third piezoelectric resonator is connected to a second input conductor of said filter structure.

6. A filter structure according to claim 1, wherein said filter structure is a ladder filter structure.

7. A filter structure according to claim 1, wherein said filter structure is a lattice filter structure.

8. A filter structure according to claim 1, wherein said first piezoelectric resonator and said second piezoelectric resonator are bulk acoustic wave resonators.

9. A filter structure according to claim 8, wherein said piezoelectric resonators forming said plurality of piezoelectric resonators are bulk acoustic wave resonators.

10. A filter structure according to claim 9, wherein said bulk acoustic wave resonators are formed on an unpatterned layer of piezoelectric material.

11. A filter structure according to claim 9, wherein said bulk acoustic wave resonators are formed on a patterned layer of piezoelectric material.

12. A filter structure according to claim 11, wherein said bulk acoustic wave resonators are formed on separate blocks of piezoelectric material.

13. A filter structure according to claim 1, wherein said first piezoelectric resonator and said second piezoelectric resonator are surface acoustic wave resonators.

14. A filter structure having a certain impedance level and having a first surface acoustic wave resonator, whose resonance frequency is a first resonance frequency and which is connected to an input conductor of said filter structure, said filter structure comprising, in order to increase the power handling capacity of the filter structure, a second surface acoustic wave resonator, a first electrode of said first surface acoustic wave resonator being connected to a first electrode of said second surface acoustic wave resonator, and said second surface acoustic wave resonator forming together with the first surface acoustic wave resonator a plurality of piezoelectric resonators connected in series, and wherein

- each piezoelectric resonator belonging to said plurality of piezoelectric resonators has a resonance frequency substantially equal to the first resonance frequency,
- said plurality of piezoelectric resonators is connected to the rest of the filter structure only through a second electrode of the first surface acoustic wave resonator and through a second electrode of the second surface acoustic wave

resonator, and
- impedance of said plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

15. A filter structure according to claim 14, further comprising a second plurality of piezoelectric resonators connected in series, said plurality comprising at least two piezoelectric resonators, and wherein
- each piezoelectric resonator belonging to said second plurality of piezoelectric resonators has a resonance frequency equal to a second resonance frequency,
- said second plurality of piezoelectric resonators is connected to the rest of the filter structure only through a third piezoelectric resonator at one end of said second plurality of piezoelectric resonators connected in series and through a fourth piezoelectric resonator, which is at the other end of said second plurality of piezoelectric resonators connected in series, and
- the impedance of said second plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

16. A filter structure according to claim 15, wherein the first resonance frequency is substantially equal to the second resonance frequency.

17. A filter structure according to claim 15, wherein the first resonance frequency is different from the second resonance frequency.

18. A filter structure according to claim 15, wherein said third piezoelectric resonator is connected to a second input conductor of said filter structure.

19. A filter structure according to claim 14, wherein said filter structure is a ladder filter structure.

20. A filter structure according to claim 14, wherein said filter structure is a lattice filter structure.

21. A filter structure having a certain impedance level and having a first bulk acoustic wave resonator, whose resonance frequency is a first resonance frequency and which is connected to an input conductor of said filter structure, said filter structure further comprising, in order to increase the power handling capacity of the filter structure, a second bulk acoustic wave resonator, a first electrode of said first bulk acoustic wave resonator being connected to a first electrode of said second bulk acoustic wave resonator, and said second bulk acoustic wave resonator forming together with the first bulk acoustic wave resonator a plurality of

piezoelectric resonators connected in series, and wherein
- each piezoelectric resonator belonging to said plurality of piezoelectric resonators has a resonance frequency substantially equal to the first resonance frequency,
- said plurality of piezoelectric resonators is connected to the rest of the filter structure only through a second electrode of the first bulk acoustic wave resonator and through a second electrode of the second bulk acoustic wave resonator,
- the first bulk acoustic wave resonator and the second bulk acoustic wave resonator are not formed using a single unpatterned piezoelectric layer, and
- impedance of said plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

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22. A filter structure according to claim 21, further comprising a second plurality of piezoelectric resonators connected in series, said plurality comprising at least two piezoelectric resonators, and wherein
- each piezoelectric resonator belonging to said second plurality of piezoelectric resonators has a resonance frequency equal to a second resonance frequency,
- said second plurality of piezoelectric resonators is connected to the rest of the filter structure only through a third piezoelectric resonator at one end of said second plurality of piezoelectric resonators connected in series and through a fourth piezoelectric resonator, which is at the other end of said second plurality of piezoelectric resonators connected in series, and
- the impedance of said second plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

23. A filter structure according to claim 22, wherein the first resonance frequency is substantially equal to the second resonance frequency.

24. A filter structure according to claim 22, wherein the first resonance frequency is different from the second resonance frequency.

25. A filter structure according to claim 22, wherein said third piezoelectric resonator is connected to a second input conductor of said filter structure.

26. A filter structure according to claim 21, wherein said filter structure is a ladder filter structure.

27. A filter structure according to claim 21, wherein said filter structure is a lattice filter structure.

28. A filter structure according to claim 21, wherein said first and second bulk acoustic wave resonators are formed on a patterned layer of piezoelectric material and connected together using vias.

29. A filter structure according to claim 21, wherein said first and second bulk acoustic wave resonators are formed on separate blocks of piezoelectric material.

30. A filter structure comprising
- a first filter branch for filtering a first signal, said first filter branch having a first input conductor, a first output conductor and a plurality of piezoelectric resonators connected in series, said plurality having at least two piezoelectric resonators, and
- a second filter branch for filtering a second signal, said second filter branch having a second input conductor and a second output conductor and said first output conductor being connected to said second input conductor,
wherein
- each piezoelectric resonator belonging to said plurality of piezoelectric resonators has a substantially same resonance frequency,
- said plurality of piezoelectric resonators is connected to the rest of the first filter branch only through a first piezoelectric resonator at one end of said plurality of piezoelectric resonators connected in series, said first piezoelectric resonator being connected to the first input conductor, and through a second piezoelectric resonator, which is at the other end of said plurality of piezoelectric resonators connected in series, and
- impedance of said plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the first filter branch.

31. A filter structure according to claim 30, wherein a passband of the first filter branch is different from the passband of the second filter branch.

32. A filter structure according to claim 30, wherein said first and second piezoelectric resonators are bulk acoustic wave resonators.

33. A filter structure according to claim 30, wherein said first and second piezoelectric resonators are surface acoustic wave resonators.

34. An arrangement for transmitting and receiving radio frequency signal, comprising
- first amplification means for amplifying a first signal,
- second amplification means for amplifying a second signal, and
- a filter structure comprising

- a first filter branch for filtering the first signal, said first filter branch having a first input conductor, a first output conductor and a plurality of piezoelectric resonators connected in series, said plurality having at least two piezoelectric resonators,
- a second filter branch for filtering the second signal, said second filter branch having a second input conductor and a second output conductor,

wherein

- said first output conductor is connected to said second input conductor, said first input conductor is coupled to an output of the first amplification means and said second output conductor is coupled to an input of the second amplification means,
- each piezoelectric resonator belonging to said plurality of piezoelectric resonators has a substantially same resonance frequency,
- said plurality of piezoelectric resonators is connected to the rest of the first filter branch only through a first piezoelectric resonator at one end of said plurality of piezoelectric resonators connected in series, said first piezoelectric resonator being connected to the first input conductor, and through a second piezoelectric resonator, which is at the other end of said plurality of piezoelectric resonators connected in series, and
- impedance of said plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the first filter branch.

35. An arrangement according to claim 34, wherein a passband of the first filter branch is different from the passband of the second filter branch.

36. An arrangement according to claim 34, wherein said first and second piezoelectric resonators are bulk acoustic wave resonators.

37. An arrangement according to claim 34, wherein said first and second piezoelectric resonators are surface acoustic wave resonators.

38. An arrangement for transmitting radio frequency signal, comprising

- amplification means for amplifying a radio frequency signal, and
- a filter structure for filtering the amplified radio frequency signal, said filter structure comprising a plurality of piezoelectric resonators connected in series, said plurality having at least two piezoelectric resonators,

wherein

- each piezoelectric resonator belonging to said plurality of piezoelectric resonators has a substantially same resonance frequency,
- said plurality of piezoelectric resonators is connected to the rest of the filter

structure only through a first piezoelectric resonator at one end of said plurality of piezoelectric resonators connected in series, said first piezoelectric resonator being connected to an input conductor of said filter structure, and through a second piezoelectric resonator, which is at the other end of said plurality of piezoelectric resonators connected in series, and
- impedance of said plurality of piezoelectric resonators connected in series is arranged to match the impedance level of the filter structure.

39. An arrangement according to claim 38, wherein a passband of the first filter branch is different from the passband of the second filter branch.

40. An arrangement according to claim 38, wherein said first and second piezoelectric resonators are bulk acoustic wave resonators.

41. An arrangement according to claim 38, wherein said first and second piezoelectric resonators are surface acoustic wave resonators.

42. A method for designing a filter comprising the following steps of:
- specifying a filter construction, which comprises piezoelectric resonators, said filter construction achieving a target frequency response,
- replacing in the filter construction an original piezoelectric resonator having a first resonance frequency with a plurality of piezoelectric resonators, each of which has a resonance frequency substantially equal to the first resonance frequency, and the impedance of the plurality of piezoelectric resonators being connected in series being the same as the impedance of the original piezoelectric resonator, and
- selecting the number of piezoelectric resonators in said plurality of piezoelectric resonators.

43. A method according to claim 42, further comprising the steps of:
- defining a target power handling capacity,
- determining a power handling capacity of the filter construction having the plurality of piezoelectric resonators, and
- determining a frequency response of the filter construction having the plurality of piezoelectric resonators,
and ~~in that~~ in the step of selecting the number of piezoelectric resonators in said plurality of piezoelectric resonators, the selection is performed so that a balance between the power handling capacity of the filter structure and the frequency response of the filter construction is achieved.